

it had freshened into a gale, which was accompanied by intense and suffocating heat, that penetrated houses and even cellars, to the great discomfort of the inhabitants. Streams of heated air could be seen rising from the earth, the roofs of houses and objects near the surface appeared to be wrapped in a whitish glare. At 3.35 p. m. the thermometer stood at 103°.2, the highest temperature ever recorded at this station. Towards evening the heat abated somewhat, falling to 81°.3 at 11 p. m. The gale ended at 6.50 p. m., having reached its maximum velocity of twenty-seven miles from the south between 2 and 3 p. m. At 3 p. m. of the 25th a gale set in from the southwest, and was also accompanied by a high temperature, the maximum being 102°.0.

## FROSTS.

During the latter part of the month telegrams were issued by the Chief Signal Officer to observers in Dakota, Nebraska, northern Wisconsin and Michigan, and western Minnesota, predicting frosts in those localities. The telegrams are given below, also the reports of frost, as received from Signal Service and voluntary observers:

The following telegram was sent to observers at La Crosse, Wisconsin; Duluth, Minnesota; Marquette, Escanaba, Alpena, and Mackinaw City, Michigan:

WASHINGTON CITY, August 29, 1886—6.36 p. m.

Cool wave approaching; frosts are indicated for northern Michigan and northern Wisconsin to-morrow night.

Observers at Saint Paul, Minnesota, Huron and Yankton, Dakota, received the following telegram:

WASHINGTON CITY, August 29, 1886—6.40 p. m.

Cool wave approaching; frosts are indicated for Dakota and western Minnesota to-morrow morning.

The observers at North Platte and Omaha, Nebraska, received the following telegram:

WASHINGTON CITY, August 30, 1886—10.16 a. m.

Light frosts are indicated for to-night in Nebraska.

The following reports of frost will serve to show that these warnings were justified:

Richardton, Stark county, Dakota: the first frost of the season occurred here on the morning of the 30th, killing an amount of vegetables.

Huron, Dakota: a heavy frost occurred here on the morning of the 31st; late corn, flax, and all kinds of vines were injured, in many cases destroyed.

Alta, Marshall county, Dakota: corn and other crops were injured by frost on the morning of the 31st.

Fort Yates, Dakota: a killing frost occurred on the morning of the 31st; minimum temperature, 31°.7.

Webster, Day county, Dakota: on the morning of the 31st the first frost of the season occurred, killing corn, vines, etc. Ice formed one-tenth of an inch thick on standing water; minimum temperature, 31°.0. Frost was also reported from Fort Totten and Yankton on the 31st.

Hay Springs, Sheridan county, Nebraska: a very light frost occurred on the 31st in the lowlands six miles south of this place. No injury was done to vegetation. Frost was also reported from Valentine, Nebraska, on the 31st.

Frosts were reported from Michigan, at Reed City, Allegan, Greenville, Hudson, and Traverse City, on the 31st; from Minnesota, at Duluth, Moorhead, and Saint Vincent, on the 31st; from Wisconsin, at Embarras and Fond du Lac, on the 31st.

The following is from the "Evening Wisconsin," of August 31st, published at Milwaukee:

The frost warnings for northern Wisconsin, sent out by the Signal Service yesterday, were verified, as light frosts are reported this morning along the valley division of the Saint Paul road and in the marshes around Berlin. The report from Berlin, received at the Saint Paul railroad office, adds that the frost was light and did no damage. The minimum mercury recorded at the government observatory in Milwaukee was 48°, the lowest since June 8th, when 42°.4 was recorded. The next lowest was 49°, July 18th. At Escanaba, Michigan, 42° was the minimum; at Marquette, Michigan, 45°; at Duluth, Minnesota, 40°; at Saint Paul, Minnesota, 42°; at La Crosse, Wisconsin, 49°; at Des Moines, Iowa, 46°; at Fargo, Dakota, 32°; at Huron, Dakota, 33°; at Saint Vincent, Minnesota, 33°; at Bismarck, Dakota, 34°; at Assinaboine, Montana, 38°.

Frosts were also reported to have occurred in the various states and territories, as follows:

Boston, Massachusetts: light frost occurred in parts of the surrounding country on the morning of the 23d. Considerable damage was done to the cranberry crop in Norfolk county.

Lansing, Michigan: frost is reported as having occurred near Lansing on the 2d, doing considerable damage to corn.

Colorado.—Pike's Peak, 21st.

Connecticut.—North Colebrook, 22d, 23d.

Iowa.—Oskaloosa, 29th, 30th; Dubuque, Bancroft, Cedar Rapids, Independence, Logan, Manchester, and Monticello, 31st.

Massachusetts.—Dudley, 3d; Westborough, 23d.

Michigan.—Marquette, 2d, 18th; Mackinaw City, 4th.

Nevada.—Carson City, 21st.

New Hampshire.—Mount Washington, 7th, 17th, 18th, 21st, 31st; Nashua, 23d.

New York.—North Volney, 6th.

Ohio.—Wauseon, 3d.

Oregon.—Fort Klamath, 9th, 22d, 26th; Lakeview, 17th, 21st, 22d.

Pennsylvania.—Wellsborough and Grampian Hills, 4th; Dyberry, 23d.

## TEMPERATURE OF WATER.

The following table shows the highest and lowest temperatures of water observed at the several stations; the monthly ranges of water temperature; the average depth at which the observations were made; and the mean temperature of the air:

Temperature of water for August, 1886.

Station.	Temperature at bottom.		Range.	Average depth, feet and tenths.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey .....	78.0	66.0	12.0	11.5	71.4
Alpena, Michigan .....	69.6	63.6	6.0	12.2	62.8
Augusta, Georgia .....	86.3	74.3	12.0	8.3	77.6
Baltimore, Maryland .....	80.1	75.5	4.6	12.0	77.5
Block Island, Rhode Island .....	66.6	63.1	3.5	8.5	67.2
Boston, Massachusetts .....	69.2	59.1	10.1	20.4	67.7
Buffalo, New York .....	75.0	69.9	5.1	10.8	67.5
Cedar Keys, Florida .....	80.8	78.7	2.1	8.6	80.8
Charleston, South Carolina .....	85.1	79.4	5.7	37.9	77.4
Chicago, Illinois .....	73.2	67.3	5.9	8.6	72.4
Chincoteague, Virginia .....	84.6	71.0	13.6	3.8	73.2
Cleveland, Ohio .....	75.0	71.7	3.3	14.0	69.5
Detroit, Michigan .....	73.7	68.0	5.7	26.7	70.2
Duluth, Minnesota .....	69.5	58.8	10.7	10.4	63.9
Eastport, Maine .....	52.8	50.3	2.5	17.2	59.2
Escanaba, Michigan .....	68.4	62.8	5.6	18.5	62.8
Galveston, Texas .....	89.1	82.7	6.4	13.6	83.2
Grand Haven, Michigan .....	75.1	64.0	11.1	19.0	67.1
Indianapolis, Texas .....	88.7	82.7	6.0	18.0	80.4
Jacksonville, Florida .....	89.8	83.8	6.0	18.8	84.9
Key West, Florida .....	67.5	60.2	7.3	10.0	63.6
Mackinaw City, Michigan .....	86.1	74.1	12.0	12.9	76.5
Marquette, Michigan .....	69.3	54.6	14.7	12.2	62.8
Milwaukee, Wisconsin .....	89.5	84.1	5.4	17.6	79.9
Mobile, Alabama .....	75.4	69.8	5.6	16.9	68.2
New Haven, Connecticut .....	75.6	66.6	9.0	13.3	67.9
New London, Connecticut .....	74.7	71.1	3.6	15.6	71.0
New York City .....	81.2	74.2	7.0	16.1	74.5
Norfolk, Virginia .....	85.2	75.9	9.3	17.5	80.9
Pensacola, Florida .....	61.9	54.1	7.8	17.6	64.7
Portland, Maine .....	74.4	68.0	6.4	51.5	66.8
Portland, Oregon .....	78.0	71.5	6.5	11.3	70.3
Sandy Hook, New Jersey .....	74.4	69.3	5.1	13.1	71.8
San Francisco, California .....	61.3	58.4	2.9	38.0	58.5
Savannah, Georgia .....	83.7	78.7	5.0	9.7	79.9
Smithville, North Carolina .....	84.6	78.5	6.1	11.0	77.4
Toledo, Ohio .....	77.1	72.1	5.0	13.6	69.3
Wilmington, North Carolina .....	82.1	76.1	6.0	9.7	77.0

\* Observations temporarily suspended.

† Record for 24 days.

## PRECIPITATION.

[Expressed in inches and hundredths.]

The distribution of rainfall over the United States and Canada for August, 1886, as determined from the reports of about seven hundred stations, is exhibited on chart iii.

The most noted feature in connection with the precipitation of the month is its inequality within small distances, thus at Rochester, New York, the rainfall is 4.31 in excess of the normal, while Buffalo, New York, shows a deficiency of 0.65; Indianapolis, Indiana, excess, 3.42; Cincinnati, Ohio, defi-

ciency, 1.17; Keokuk, Iowa, excess, 2.81; Des Moines, Iowa, deficiency, 3.75; Fort Yates, Dakota, excess, 2.93; Bismarck, Dakota, deficiency, 1.26, etc. The rainfall is, however, generally below the normal in the Lake region, Gulf region, south Atlantic states, Florida, upper Mississippi valley, extreme northwest, Montana, and along the Pacific coast, except at Los Angeles, California, where an excess of 0.21 occurs. Especially large deficiencies occur in Iowa, Florida, and along the Gulf coast. All stations in Arizona show an excess of rainfall, as well as several in the Ohio and Missouri valleys and in Tennessee.

In the following table are shown, for the several geographical districts, the normal precipitation for August; the average for August, 1886, and the excess or deficiency as compared with the normal:

Average precipitation for August.

Districts.	Average for August, Signal-Service observations.		Comparison of August, 1886, with the average for several years.
	For several years.	For 1886.	
	Inches.	Inches.	Inches.
New England.....	4.20	3.30	-0.90
Middle Atlantic States.....	4.70	3.88	-0.82
South Atlantic States.....	6.24	5.05	-1.19
Florida Peninsula.....	7.48	5.50	-1.98
Eastern Gulf States.....	5.49	4.12	-1.37
Western Gulf States.....	3.36	2.69	-0.67
Rio Grande Valley.....	4.32	1.86	-2.46
Tennessee.....	3.70	5.28	+1.58
Ohio Valley.....	3.59	3.70	+0.11
Lower lake region.....	3.64	3.49	-0.15
Upper lake region.....	3.27	3.68	+0.41
Extreme northwest.....	2.71	1.85	-0.86
Upper Mississippi Valley.....	3.50	2.90	-0.60
Missouri Valley.....	3.20	3.57	+0.37
Northern slope.....	1.37	0.79	-0.58
Middle slope.....	2.54	1.82	-0.72
Southern slope.....	4.00	2.68	-1.32
Southern plateau.....	2.80	3.50	+0.70
Middle plateau.....	0.46	0.30	-0.16
Northern plateau.....	0.15	0.11	-0.04
North Pacific coast region.....	0.61	0.15	-0.46
Middle Pacific coast region.....	0.02	trace	-0.02
South Pacific coast region.....	0.17	0.81	+0.64

The following are some of the most marked departures from the normal precipitation at Signal Service stations:

Above normal.		Below normal.	
	Inches.		Inches.
Norfolk, Virginia.....	4.58	Charleston, South Carolina.....	4.87
Rochester, New York.....	4.31	Sanford, Florida.....	4.08
Grand Haven, Michigan.....	3.57	New York City.....	3.91
Memphis, Tennessee.....	3.44	Des Moines, Iowa.....	3.75
Indianapolis, Indiana.....	3.42	Philadelphia, Pennsylvania.....	3.73
Fort Yates, Dakota.....	2.93	Wilmington, North Carolina.....	3.52
Keokuk, Iowa.....	2.87	Mobile, Alabama.....	3.46
Huron, Dakota.....	2.70	Bio Grande City, Texas.....	3.42

## DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows, for certain stations, as reported by voluntary observers, the average precipitation for the month of August for a series of years, the precipitation for August, 1886, and the departures from the average:

Station.	County.	Average precipitation for August.	Number of years.	Precipitation for August, 1886.	Departure.
		Inches.		Inches.	Inches.
<i>Arkansas.</i>					
Lead Hill.....	Boone.....	5.03	4	3.91	-1.12
<i>California.</i>					
Sacramento.....	Sacramento.....	0.00	20	0.00	0.00
<i>Connecticut.</i>					
Canton.....	Hartford.....	5.04	25	2.77	-2.27
Hartford.....	Hartford.....	4.46	15	2.12	-2.34
Middletown.....	Middlesex.....	4.95	28	3.23	-1.72
New Haven.....	New Haven.....	5.72	14	4.56	-1.16
Wallingford.....	New Haven.....	5.04	29	3.23	-1.81
<i>Dakota.</i>					
Webster.....	Day.....	2.57	4	2.36	-0.21
<i>Illinois.</i>					
Anna.....	Union.....	4.40	11	2.63	-1.77
Mattoon.....	Coles.....	3.66	6	3.30	-0.36
Peoria.....	Peoria.....	3.16	30	3.30	+0.14

## Deviations from average precipitation—Continued.

Station.	County.	Average precipitation for June.	Number of years.	Precipitation for June, 1886.	Departure.
		Inches.		Inches.	Inches.
<i>Illinois—Continued.</i>					
Riley.....	McHenry.....	3.55	25	5.85	+2.30
Sycamore.....	De Kalb.....	3.68	5	4.29	+0.61
<i>Indiana.</i>					
Lafayette.....	Tippecanoe.....	2.84	7	4.46	+1.62
Logansport.....	Cass.....	3.34	31	6.30	+2.96
Spiceland.....	Henry.....	3.28	28	6.88	+3.60
Vevay.....	Switzerland.....	3.14	21	3.18	+0.04
<i>Iowa.</i>					
Monticello.....	Jones.....	3.92	33	2.38	-1.54
<i>Kansas.</i>					
Atchison.....	Atchison.....	4.28	22	1.76	-2.52
Independence.....	Montgomery.....	3.00	14	4.25	+1.25
Lawrence.....	Douglas.....	3.59	19	2.49	-1.10
Wollington.....	Sumner.....	3.11	8	2.96	-0.15
Yates Centre.....	Woodson.....	1.99	6	3.51	+1.52
<i>Maine.</i>					
Cornish.....	York.....	4.14	29	4.08	-0.06
Gardiner.....	Kennebec.....	3.74	48	2.82	-0.92
Orono.....	Penobscot.....	3.16	18	2.27	-0.89
<i>Maryland.</i>					
Fallston.....	Harford.....	5.20	15	4.53	-0.67
<i>Massachusetts.</i>					
Amherst.....	Hampshire.....	4.35	51	2.92	-1.43
Cambridge.....	Middlesex.....	4.68	45	2.80	-1.88
Chestnut Hill.....	Middlesex.....	3.52	11	3.52	0.00
Framingham.....	Middlesex.....	3.86	12	3.79	-0.07
Lake Cochituate.....	Middlesex.....	5.00	35	3.75	-1.25
Lynn.....	Essex.....	3.80	12	3.59	-0.21
Mystic Lake.....	Middlesex.....	3.61	11	3.00	-0.61
New Bedford.....	Bristol.....	4.10	73	2.76	-1.34
Somerset.....	Bristol.....	4.49	16	3.53	-0.96
Springfield.....	Hampden.....	4.49	39	3.31	-1.18
Waltham.....	Middlesex.....	4.42	62	2.78	-1.64
Worcester.....	Worcester.....	5.40	50	3.81	-1.59
<i>Nevada.</i>					
Carson City.....	Ormsby.....	0.10	8	0.00	-0.10
<i>New Brunswick.</i>					
Saint John.....	Saint John.....	3.67	26	3.17	-0.50
<i>New Hampshire.</i>					
Concord.....	Merrimac.....	5.04	25	2.77	-2.27
Hanover.....	Grafton.....	2.87	21	2.25	-0.62
<i>New Jersey.</i>					
South Orange.....	Essex.....	4.97	16	1.10	-3.87
<i>New York.</i>					
Palermo.....	Oswego.....	2.24	33	2.30	+0.06
Plattsburg Barracks.....	Clinton.....	2.66	17	3.97	+1.31
<i>Ohio.</i>					
Wauseon.....	Fulton.....	2.90	14	4.86	+1.96
Westerville.....	Franklin.....	3.02	12	2.51	-0.51
<i>Pennsylvania.</i>					
Dyberry.....	Wayne.....	3.33	15	1.98	-1.35
<i>South Carolina.</i>					
Kirkwood.....	Kershaw.....	4.95	20	2.38	-2.57
Stateburg.....	Sumter.....	3.33	6	2.12	-1.21
<i>Texas.</i>					
New Ulm.....	Austin.....	3.12	15	4.64	+1.52
<i>Vermont.</i>					
Lunenburg.....	Essex.....	3.70	38	4.70	+1.00
Nowport.....	Orleans.....	3.88	12	5.00	+1.12
Strafford.....	Orange.....	3.60	12	3.20	-0.40
<i>Virginia.</i>					
Bird's Nest.....	Northampton.....	4.20	18	6.20	+2.00
Dale Enterprise.....	Rockingham.....	4.60	6	5.85	+1.25
Variety Mills.....	Nelson.....	3.21	8	2.88	-0.33
Wytheville.....	Wythe.....	3.75	22	4.78	+1.03
<i>West Virginia.</i>					
Helvetia.....	Randolph.....	4.48	10	3.77	-0.71

\* From the "Bulletin of the New England Meteorological Society."

The following notes, in connection with this subject, are from voluntary observers:

*Illinois.*—Sandwich, De Kalb county: the greatest August rainfall was that of 1862, 8.88; the least fell in 1881, 0.30.

Riley, McHenry county: the total rainfall of the summer of 1886, 8.55, is 3.13 less than the normal as deduced from the observations of twenty-five preceding summers; a smaller amount fell only during the summers of 1863, 1873, and 1883; 3.53 fell on the night of August 28-29th; until that date the rainfall of the present summer was the least.

*Indiana.*—Logansport, Cass county: the rainfall of August, 1876, 9.14, is greater than that of any August during the past thirty-one years; that of 1861, 0.17, is less.

Spiceland, Henry county: the rainfall for this month, 6.88, is greater than that of any August in the last twenty-eight years.

Vevay, Switzerland county: during the past twenty-one years large August rainfalls occurred in 1879, 10.90; 1876, 6.15; 1882, 5.99. Small rainfalls occurred in 1884, 0.54; 1881, 1.20.

*Iowa.*—Monticello, Jones county: the rainfall of August, 1885, 8.54, is the greatest, and that of August 1866, 1.17, is the least that has occurred in August during the past thirty-three years.

*Kansas.*—Lawrence, Douglas county: rain in measurable quantities fell on eleven days. There were six thunder showers. The entire rainfall for the eight months of 1886, now completed, has been 17.88, which is 7.43 below the average for the same months in the preceding eighteen years. The largest August rainfall in that time occurred in 1868, 8.32; the least in 1882, 0.09.

Yates Centre, Woodson county: the total rainfall of the summer of 1886, 10.67, is 0.51 below the normal.

*Maine.*—Cornish, York county: the rainfall of August, 1867, 9.00, is greater than that of any other August in the last twenty-nine years; that of 1876, 0.16, is less.

*Maryland.*—Fallston, Harford county: the rainfall of August, 1872, 11.15, is greater than that of any other August in the last fifteen years; that of 1881, 1.10, is less.

*New Jersey.*—South Orange, Essex county: the rainfall of the summer of 1886, 7.08, is 5.61 less than the average summer rainfall.

*New York.*—Palermo, Oswego county: during the past thirty-three years the largest August rainfall occurred in 1864, 6.40; the least, in 1870, 0.50.

*Ohio.*—Wauseon, Fulton county: the rainfall of the month, 4.86, is greater than that of any other August in the last fourteen years; the least fell in 1884, 1.12; the total rainfall of the summer, 7.18, is 4.49 less than the normal.

Westerville, Franklin county: in the past twelve years the greatest August rainfall occurred in 1880, 4.33; the least, in 1884, 1.07.

*Pennsylvania.*—Dyberry, Wayne county: in the past nineteen years the greatest August rainfall, 8.77, occurred in 1885; the least, 0.95, in 1883.

*Texas.*—New Ulm, Austin county: the largest rainfall in the past fifteen Augusts occurred in 1878, 8.38; the least in 1885, 0.09.

*Virginia.*—Wytheville, Wythe county: the total rainfall of the first eight months of 1886, 37.08, is 7.42 above the normal.

Variety Mills, Nelson county: the largest rainfall in the past nine Augusts, 7.29, occurred in 1879; the least, 0.57, in 1881.

#### MONTHLY SNOWFALLS.

The following monthly snowfalls have been reported:

Mount Washington, New Hampshire, on the 23d, 0.3 inch;  
Pike's Peak, Colorado, trace, on the 18th and 27th.

#### HAIL.

Miles City, Custer county, Montana: on the afternoon of the 5th a destructive thunder and hail storm occurred in the upper portion of the Yellowstone Valley. The rain and hail were unusually heavy. Crops over a strip of country six miles wide are reported to have been entirely destroyed. Near Merrill drifts of hail were found fourteen inches deep. In Park City windows and even roofs were destroyed.

Dakota, Stephenson county, Illinois: during the afternoon of the 5th a severe thunder-storm, attended by high wind and heavy hail, passed over this county. The wind damaged buildings and stripped trees of their fruit, while forest trees and growing corn were leveled to the ground. Considerable damage was done by hail throughout the surrounding country.

Janesville, Rock county, Wisconsin: a hail storm did great damage to growing tobacco on the afternoon of the 6th. Some fields north of the town were entirely destroyed.

Fort Yates, Dakota: on the 10th, between 8.55 and 10 p. m., a severe thunder-storm, attended by rain, hail, and high wind, prevailed here. During the storm the wind attained a maximum velocity of forty-five miles per hour from the southeast. The hail-stones were unusually large, ten, which were carefully measured by the observer, averaged three inches in diameter, the largest being three and a half. The stones were spherical in shape, with cylindrical protuberances, one-half to three-fourths of an inch long, projecting from their sides. Those that fell at the beginning of the storm were very hard on the outside but the centre consisted of dry compact snow. About 1,200 panes of glass were broken in the post and Indian agency buildings. The severity of the hail storm may be judged from the fact that all branches an inch thick or less were broken from cottonwood trees. During the storm a notable fall of temperature occurred, the temperature before the storm being 92°; after, 66°.

Hail was also reported to have fallen in the various states and territories, as follows:

*Arizona.*—Fort Verde, 12th; Fort McDowell, 30th.

*Arkansas.*—Fort Smith, 28th.

*California.*—Susanville, 30th.

*Colorado.*—Pike's Peak, 1st, 2d, 5th, 6th, 10th, 25th, 28th, 30th.

*Dakota.*—Fort Totten, 5th; Huron, 7th, 10th, 15th, 19th; Fort Yates, 13th, 15th.

*Illinois.*—South Evanston, 22d, 28th, 29th.

*Indiana.*—Logansport, 11th.

*Iowa.*—Cairo, 6th, 17th, 22d.

Table of excessive and greatest monthly precipitation for August, 1886.

Station.	Specially heavy.		Largest monthly.	Amount.	Station.	Specially heavy.		Largest monthly.	Amount.
	Date.	Amt.				Date.	Amt.		
<i>Alabama.</i>					<i>Missouri—Con.</i>				
Newton.....	29, 30	7.25	10.35		Central College...	18	2.21		
Valley Head.....	24	3.00	8.22		Lamar.....	3	3.08		
Eufaula.....	19	2.02	7.57		<i>Nebraska.</i>				
Greensborough.....	1, 2	2.19	7.31		Stockham.....			6.75	
Do.....	18	2.00			<i>New Hampshire.</i>				
Mt. Vernon B'ks.....	22, 23	4.64	6.90		Mt. Washington.....	3, 4	2.62	8.34	
Carrollton.....	23, 24	2.68	6.70		<i>New Jersey.</i>				
Oswichee.....	19	2.00	6.55		Atlantic City.....	7	2.48		
Selma.....	23, 24	2.74	6.54		Egg Harbor City.....	7	4.49		
Calera.....	2	2.01	6.32		Vineland.....	7	3.63		
Do.....	5	3.00			<i>New Mexico.</i>				
University of Ala'ma.....			6.67		Fort Union.....			8.04	
Opelika.....	19, 20	2.17			<i>New York.</i>				
Montgomery.....	16	2.19			Rochester.....	30	3.34	7.26	
<i>Alaska.</i>					Mountainville.....	1	2.00		
Sitka.....			10.72		<i>North Carolina.</i>				
<i>Connecticut.</i>					Goldsbrough.....	15	2.12	14.25	
New Haven.....	2	2.45			Do.....	18, 19	5.50		
<i>Dakota.</i>					Lenoir.....	12, 13	2.50	10.20	
Yankton.....	8	2.53			Do.....	16, 17	2.90		
Huron.....	19, 20	2.49			Chapel Hill.....	11	3.70	9.91	
<i>Florida.</i>					Hatteras.....	6, 7	2.15	9.74	
Manatee.....	12	2.00	11.43		Do.....	24	2.20		
Do.....	30, 31	2.20			New-Berne.....	15	2.00	8.96	
Fort Meade.....	7, 8	5.85	10.50		Raleigh.....	10, 11	3.04	8.19	
Live Oak.....	20	2.06	8.93		Do.....	18, 19	2.25		
Limona.....	8	2.15	8.91		Lumberton.....	19	4.37	8.18	
Do.....	30	2.30			Kitty Hawk.....			7.34	
Pensacola.....	26	2.25	8.82		Fort Macon.....			7.08	
Do.....	30	3.07			Raleigh.....			6.90	
Tallahassee.....	1, 2	2.50	7.75		Charlotte.....	6	3.19	6.34	
Do.....	26, 27	2.25			Wadesborough.....			6.16	
Cedar Keys.....	27	2.84	7.08		Statesville.....	18	2.21		
Fort St. Augustine.....	29, 30	2.00	6.70		<i>Ohio.</i>				
Jacksonville.....	26	2.95	6.25		Greenville.....	17	3.70	8.72	
Key West.....	6, 7	3.31			West Milton.....	11	2.00	7.75	
Alva.....	8	3.25			Do.....	16	3.00		
Sanford.....	7, 8	2.34			Hanging Rock.....	22	3.00	6.29	
<i>Georgia.</i>					Newcomertown.....	14	2.78	6.06	
Jessup.....	26	2.70	9.97		College Hill.....	17	2.90		
Washington.....	18	4.25	7.60		Jacksonborough.....	16, 17	2.50		
Savannah.....			7.32		Sidney.....	16	2.55		
Toccoa.....	23	3.04	7.20		North Lewisburg.....	15, 16	2.70		
Columbia.....	20	3.29	6.49		<i>Pennsylvania.</i>				
Thomasville.....	19, 20	2.10	6.05		Blooming Grove.....	1	3.00		
Milledgeville.....	1, 2	3.37			<i>South Carolina.</i>				
<i>Illinois.</i>					Allendale.....	2	2.30	8.36	
Rockford.....	15	2.30	8.41		Cheraw.....	18, 19	4.15	8.23	
Do.....	28	5.32			Spartanburg.....	28	2.03	7.38	
Riley.....	28, 29	3.33			Pacolet.....	9, 10	3.57	7.01	
<i>Indiana.</i>					Saint George's.....	3, 4	2.86	6.77	
Connersville.....	17	2.16	7.43		Spartanburg b.....	10	2.00	6.07	
Sunman.....	16, 17	2.13	7.38		Branchville.....	3, 4	2.31		
Do.....	28	2.10			Florence.....	3	2.14		
Maunzy.....	17	2.24	7.31		Greenwood.....	18	2.03		
Spiceland.....	16	2.25	6.88		Anderson.....	18	2.00		
Indianapolis.....	6	2.11	6.70		Yemassee.....	3, 4	2.95		
Logansport.....	16	3.20	6.30		Alken.....	27	3.30		
Butlerville.....			6.00		<i>Tennessee.</i>				
LaGrange.....	20, 21	2.00			Ridgelyton.....	30	2.55	8.28	
Monticello.....	29	2.81			Memphis.....	1, 2	3.27	6.49	
<i>Iowa.</i>					Do.....	28, 29	2.04		
Fort Madison.....	13	3.50	6.60		Brownsville.....	1, 2	3.44	6.39	
Keokuk.....	14	3.37			Austin.....	1, 2	3.73	6.08	
<i>Kansas.</i>					Grand Junction.....	1	2.02		
Yates Centre.....	3	2.62			Covington.....	1	2.03		
Independence.....	3	3.27			Fostoria.....	1	2.00		
Sterling.....	3	3.85			<i>Texas.</i>				
<i>Louisiana.</i>					Luling.....	30	4.60	6.30	
Liberty Hill.....	25	2.96			Austin.....	20, 21	4.78	6.01	
<i>Maryland.</i>					Dallas.....	30	3.07		
Fallston.....	1	2.21			Wetmar.....	20	2.17		
Baltimore.....	7	2.21			San Antonio.....	20	4.51		
<i>Massachusetts.</i>					Fort Concho.....	20	2.40		
Westborough.....	30, 31	2.25			Comfort.....	20, 21	3.10		
<i>Michigan.</i>					<i>Virginia.</i>				
Grand Haven.....	21, 22	4.07	6.57		Norfolk.....	12, 13	3.65	10.23	
Hudson.....	21, 22	2.25			Do.....	17, 18	3.19		
Kalamazoo.....	21, 22	3.08			Chincoteague.....	6, 7	3.50	6.71	
Marquette.....	22	2.16			Fort Monroe.....	17	2.40	6.33	
Lansing.....	28	2.88			Bird's Nest.....			6.20	
Pontwater.....	20, 21, 22	3.42			Marion.....			6.09	
<i>Mississippi.</i>					Dale Enterprise.....	6, 7	2.60		
Aberdeen.....			6.29		<i>Wisconsin.</i>				
Brookhaven.....	1, 2	2.80	6.29		Dolvan.....	16	2.27	7.40	
Hazelhurst.....	1, 2	3.03			Do.....	28, 29	2.02		
Holly Springs.....	1, 2	2.54			Embarras.....	20, 21	4.45	7.00	
Hernando.....	1, 2	3.10			Madison.....	16	3.35		
<i>Missouri.</i>					Wausau.....	20, 21	3.49		
Pierce City.....	3, 4	2.00			Milwaukee.....	21, 22	2.49		
Centerville.....	29	3.50			Fond du Lac.....	21	2.25		

*Kansas.*—Salina, 5th, 31st.

*Louisiana.*—Liberty Hill, 25th.

*Michigan.*—Alpena, 13th; Mottville, 22d.

*Minnesota.*—Duluth, 11th.

*Missouri.*—Conception, 10th; Central College, 12th; Warrenton, 16th.

*Montana.*—Fort Missoula, 4th.

*Nebraska.*—Hay Springs, 7th.  
*New Mexico.*—Lava, 4th.  
*New York.*—Palmyra, 2d; Rochester, 11th, 13th.  
*Pennsylvania.*—Pittsburg, 11th.  
*South Carolina.*—Spartanburg, 6th.  
*Tennessee.*—Nashville, 6th.  
*Utah.*—Frisco, 7th.  
*Wisconsin.*—Delaware, 21st; Embarras, 26th.

## SLEET.

Sleet occurred at Pike's Peak, Colorado, on the 3d, 4th, 7th, 8th, 15th, 16th, 17th, and 31st.

## WINDS.

The most frequent directions of the wind during August, 1886, are shown on chart ii by the arrows flying with the wind; they are also given in the table of miscellaneous meteorological data. Along the Pacific coast the winds were mostly westerly; on the coast of the south Atlantic states the prevailing direction of the wind was from the southwest; in the west Gulf states the wind was generally from the southeast; in the Missouri Valley, from the south. In all other districts the wind was variable.

## HIGH WINDS.

[In miles per hour.]

Wind-velocities of fifty or more miles per hour were recorded during the month, as follows:

Mount Washington, New Hampshire, 88, nw., 4th; 61, nw., 9th; 54, nw., 10th; 64, nw., 11th; 70, w., 12th; 59, sw., 13th; 80, nw., 14th; 80, nw., 15th; 62, s., 16th; 64, nw., 26th; 55, nw., 27th; 60, sw., 30th; 57, nw., 31st.

Fort Macon, North Carolina, 56, se., 6th.

Sandy Hook, New Jersey, 60, n., 7th.

Keokuk, Iowa, 60, nw., 12th.

Galveston, Texas, 53, ne., 20th.

San Antonio, Texas, 60, n., 20th.

Fort Totten, Dakota, 52, nw., 29th.

## LOCAL STORMS AND TORNADOES.

Kalamazoo, Kalamazoo county, Michigan: a tornado is reported to have passed over parts of Kalamazoo and Barry counties at 10 a. m. of the 1st. Its course was marked by uprooted and twisted trees, unroofed barns, and prostrated windmills and fences. At the village of Hickory Corners a church steeple was blown down and many other buildings damaged. The storm was accompanied by heavy rainfall.

Hohokus, Bergen county, New Jersey: a heavy thunder and rain storm occurred at this place on the night of the 1st-2d. Shortly before midnight a high gale set in, blowing down a number of trees and destroying windows. One house was moved from its foundation and partly wrecked.

Hartland, Kearney county, Kansas: on the 5th a tornado passed over this place, demolishing twenty houses, as well as doing great damage to growing crops. Sixteen cars were blown from the Atchison, Topeka, and Santa Fé Railroad tracks, and two miles of telegraph wires west of the town were prostrated. Other towns in the vicinity of Hartland were visited by the tornado, but the damage done was slight.

Decatur, Illinois: on the afternoon of the 5th a severe thunder-storm, accompanied by high wind and hail, occurred in this section. The wind damaged buildings and stripped trees of their fruit, while large forest trees were uprooted and growing corn destroyed. Considerable damage was done by hail in the surrounding country. A heavy black cloud which preceded the storm presented the appearance of a tornado cloud, alarming the people, and causing many to seek security in cellars.

Cairo, Illinois: a very destructive storm of hail, rain, and wind occurred about 3 p. m. of the 6th at the town of Metropolis, twenty miles northeast of Cairo. Trees were uprooted, limbs torn off and carried at a rapid rate along the track of the storm, and fences, growing corn, and light buildings leveled to the ground. It is reported that hail fell to the depth of three inches and was still lying in heaps on the morning of the 7th.

Huron, Dakota: a heavy storm of rain and hail, followed by a destructive southwest gale, occurred here on the afternoon and evening of the 7th. The gale set in after the storm of hail and rain had passed, and continued only three minutes, overthrowing a number of small buildings and blowing down chimneys and fences. At the Dakota Agricultural Fair grounds the amphitheatre, grand stand, and several other structures were demolished, together with a great deal of the fencing, barns, and sheds. At the town of Newark, about one hundred miles north of here, five persons were killed and much property destroyed.

Frisco, Utah: a thunder-storm and heavy rain set in at 7.35 p. m. of the 7th. From 7.40 to 7.55 p. m. hail fell in considerable quantities. The storm did some damage by flooding cellars and undermining the trestle work of the railroad bridge near this place, rendering the passage of trains unsafe.

Aberdeen, Brown county, Dakota: on the night of the 10-11th a severe thunder-storm occurred in this town and vicinity. Northwest of this place the storm assumed the form of a tornado, destroying a farm house, several barns, and numerous grain-stacks in a track extending from ten miles west of Westport to Ordway. Another severe storm occurred here on the 16th.

Geneva, New York: between 6 and 7 p. m. of the 11th a very severe thunder-storm passed over this place. The storm was accompanied by heavy rain, hail, and wind. Many trees were uprooted and houses unroofed. The storm was also felt in Rochester, where the wind blew a gale. Much damage was done in the country by hail and in the city by overflowed sewers.

Pittsburg, Pennsylvania: a severe storm of wind and rain passed over this section at 10 p. m. of the 11th, doing a great deal of damage. Telegraph wires were blown down and several houses unroofed.

Akron, Summit county, Ohio: a destructive rain, wind, and thunder-storm occurred at this town on the night of the 11-12th. Numerous trees and fences were blown down and two houses wrecked. Fruit and other crops were destroyed in large quantities.

Keokuk, Iowa: at 3.45 p. m. of the 12th a thunder-storm and light rain began; at 3.52 p. m. the wind shifted to the northwest and a gale of sixty miles per hour and heavy rain set in. The wind decreased to brisk and veered to southeast at 4.45 p. m., the rain becoming light at the same time. The storm is estimated to have damaged property in this town to the extent of \$15,000. A number of business houses were unroofed and a church spire blown down. The storm extended over this section of the state, and reports from numerous places in the surrounding country show that considerable damage was done to buildings and crops. The vicinity of the towns of Creston and Mount Pleasant suffered severe injury.

Saint Louis, Missouri: at 7 p. m. of the 12th the wind suddenly increased in velocity from fresh to a northwest gale, blowing for a time at the rate of forty-five miles per hour, and causing a sudden fall in temperature of 18°. At 7.30 p. m. a thunder-storm and light rain set in and continued until 10 p. m. The wind carried away one hundred and fifty feet of the woodwork of a large bridge in the city, and destroyed much corn in the country.

Cairo, Illinois: a thunder-storm and high wind occurred in this vicinity shortly after 11 p. m. of the 12th. Between 11 and 11.30 p. m. the wind attained a maximum velocity of thirty-eight miles per hour from the northwest. At Hannibal, Missouri, the storm was reported to have been very severe, blowing off roofs and injuring several persons.

Springfield, Illinois: a heavy thunder-storm and high wind prevailed at this place from 6.53 p. m. until midnight of the 12th. At 7.15 p. m. the wind attained a velocity of thirty-three miles per hour from the west. A number of signs, chimneys, and fences were blown down during the gale.

Chicago, Illinois: on the 12th the long drought was broken in southern Iowa and Illinois by a severe thunder-storm, accompanied by heavy rain and high wind. Numerous reports from